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ESTIMATING DEFOLIATION CAUSED BY SPRUCE BUDWORM FROM UNDAMAGED SHOOTS

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Spruce budworm[1] is a destructive pest in Douglas-fir forests, particularly in Montana, where more than 4 million acres of forest have been infested during the past decade. Surveys and control projects in infested areas have required thousands of man-days during the period of the outbreak. Much of this time is spent making operational surveys to delineate areas of infestation. Entomologists and foresters use various methods for measuring budworm activity, but estimates of defoliation caused by budworm larvae feeding on new-growth shoots is most commonly used. Damage to foliage is expressed in percent of foliage destroyed. All of the several methods for estimating defoliation require considerable field training.

In 1959 and 1960, while measuring defoliation on new-growth Douglas-fir shoots in Montana, an inverse relation was found between the percent of undamaged shoots and the percent of defoliation. This relation offers a simple method of estimating defoliation for survey personnel. Defoliation can be estimated by merely determining the percent of undamaged shoots, which are easy to recognize and count.

The graph on page 2 shows the relation between undamaged shoots and defoliation. The data are from 27 samples of foliage taken from permanent sample plots in Montana. The data were taken incidentally to an appraisal of defoliation and consists of notes taken by survey personnel. These notes clearly showed that the number of shoots with no defoliation was related inversely to the amount of defoliation for the sample. The degree of defoliation in the 27 samples ranged from light to very heavy and represented a good cross section of defoliation in Douglas-fir in Montana.

The data were analyzed by a multiple curvilinear regression treatment when the plotted data suggested a parabolic curve. T-tests of the coefficients show the data to be highly significant at the 99-percent level. The regression in the following figure was the basis for constructing the accompanying table, which converts the percent of undamaged shoots into percent of defoliation.

In practice, 50 shoots examined at midcrown gives a good sample, but 100 shoots is better and gives a count immediately convertible to percent.

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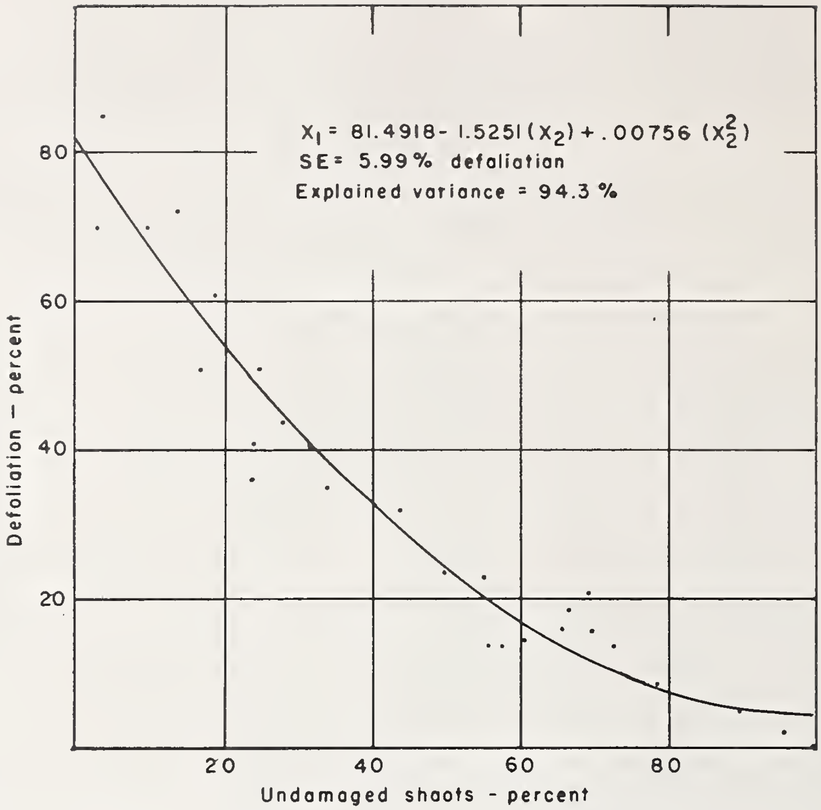
[1] Choristoneura fumiferana (Clem.)



Relation of defoliation to undamaged shoots

Relation between undamaged shoots and defoliation

Percent undamaged shoots	Percent defoliation (±6%)
0	81+
5	74
10	67
15	60
20	54
25	48
30	43
35	37
40	33
45	28
50	24
55	20
60	17
65	14
70	12
75	10
80	8
85	6
90	5
95	4.8
100	4.6